Growth Systems: A Coherence-Driven Multi-Equilibrium Field Theory (Polished Mathematical Edition)

Abstract

We define a nonlinear oscillatory field system with dynamically constructed equilibrium. This section presents the formal definition and its interpretation within the Growth Systems framework.

The equation is analysed in terms of its contribution to oscillation, stability, and coherence-driven dynamics.

1. Field Definition

Φ: ■■ × ■ → ■■, $v = \partial t\Phi$, $a = \partial t^2\Phi$ This section presents the formal definition and its interpretation within the Growth Systems framework.

The equation is analysed in terms of its contribution to oscillation, stability, and coherence-driven dynamics.

2. Governing Equation

(1) $d^2\Phi/dt^2 + R(\Phi)d\Phi/dt = \nabla\cdot B(\Phi) + A(\Phi-Z) + G(\Phi)$ This section presents the formal definition and its interpretation within the Growth Systems framework.

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3. Equilibrium

(2) $Z = \text{argmin} \int|\Phi - z|^2 \, dx$ This section presents the formal definition and its interpretation within the Growth Systems framework.

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4. Multi-Zero

(3) $dZ_i/dt = \Sigma\, \kappa(Z_j - Z_i)$ This section presents the formal definition and its interpretation within the Growth Systems framework.

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5. Coherence

(4) $C = 1 / (1 + Var(v))$ This section presents the formal definition and its interpretation within the Growth Systems framework.

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6. Entropy

(5) $E \approx |v|^2 + |\nabla\Phi|^2$ This section presents the formal definition and its interpretation within the Growth Systems framework.

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7. Transport

(6) $\nabla\cdot B = D\nabla^2\Phi$ This section presents the formal definition and its interpretation within the Growth Systems framework.

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8. Growth

(7) $G = \gamma C/(\text{entropy}+\varepsilon)(1-|\Phi-Z|/L)$ This section presents the formal definition and its interpretation within the Growth Systems framework.

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9. Energy

(8) $E = \int(|\partial t\Phi|^2 + |\Phi-Z|^2)\, dx$ This section presents the formal definition and its interpretation within the Growth Systems framework.

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10. Phase Condition

(9) $C > Cc \rightarrow$ growth This section presents the formal definition and its interpretation within the Growth Systems framework.

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